Indiana Space Grant Consortium
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PROGRAM DESCRIPTION

The National Space Grant College and Fellowship Program consists of 52 state-based, university-led Space Grant Consortia in each of the 50 states plus the District of Columbia and the Commonwealth of Puerto Rico. Annually, each consortium receives funds to develop and implement student fellowships and scholarships programs; interdisciplinary space-related research infrastructure, education, and public service programs; and cooperative initiatives with industry, research laboratories, and state, local, and other governments. Space Grant operates at the intersection of NASA's interest as implemented by alignment with the Mission Directorates and the state's interests. Although it is primarily a higher education program, Space Grant programs encompass the entire length of the education pipeline, including elementary/secondary and informal education. The **Indiana Space Grant Consortium** is a Designated Consortium funded at a level of **$845,000.00** for fiscal year 2010.

PROGRAM GOALS

INSGC Goals are as follows:

- *INSGC will be a preferred source of information, materials, and opportunities for inspiring, preparing, and supporting individuals for NASA-related STEM education and careers.*
- *INSGC will be an effective and preferred vehicle for enhancing the engagement of K-20 educators and students in full range of NASA-related STEM activities and opportunities.*
- *INSGC will raise awareness of and access to NASA-related activities, events, and opportunities for the government, institutions, and residents of the State of Indiana.*

These goals are intended to follow the NASA Education outcomes listed below:

NASA Education Outcome 1**:** *Contribute to the development of the STEM workforce in disciplines needed to achieve NASA's strategic goals. (Employ and Educate)*

Scholarship / Fellowship

1.3 Student Involvement Higher Education - Provide opportunities for groups of post–secondary students to engage in authentic NASA–related mission based R & D activities.

INSGC Scholarship and Fellowship applicants are managed through an open competitive application process to the INSGC–controlled website. For any campus with at least two valid applicants, at least one undergraduate scholarship is guaranteed, ensuring that INSGC awards are provided to all academic affiliates.

Higher Education

1.1 Faculty and Research Support – Provide NASA competency-building education and research opportunities for faculty, researchers, and post-doctoral fellows.

1.2 Student Support – Provide NASA competency–building education and research opportunities to develop qualified undergraduate and graduate students who are prepared for employment in STEM disciplines at NASA, industry, and higher education.

INSGC intends Higher Education award funds to support student participation in authentic hands-on experiences at NASA centers or industry partners, as well as team-based project activities that may occur on academic campuses.

Research Infrastructure

1.5 Targeted Institution Research and Academic Infrastructure – Improve the ability for targeted institutions to complete for NASA research and development work.

INSGC does not favor Research Infrastructure awards at our research intensive campuses (Purdue-West Lafayette and Indiana University-Bloomington). Instead, RI funds are prioritized toward supporting young faculty and student involvement in STEM research activities at our smaller undergraduate and regional campus academic affiliates.

NASA Education Outcome 2: *Attract and retain students in STEM disciplines through a progression of educational opportunities for students, teachers, and faculty (Educate and Engage)*

Pre-college/Higher Education/General Public

2.1 Educator Professional Development – Provide short duration professional development and training opportunities to educators, equipping them with the skills and knowledge to attract and retain students in STEM disciplines.

2.3 Curricular Support Resources – Provide curricular support resources that use NASA themes and content to a) enhance student skills and proficiency in STEM

disciplines; b) inform students about STEM career opportunities; and c) communicate information about NASA's mission activities.
2.4 Student Involvement K – 12 - Provide K – 12 students with authentic first hand opportunities to participate in NASA mission activities, thus inspiring interest in STEM disciplines and careers; Provide opportunities for family involvement for K – 12 students learning in STEM areas.

Beginning in 2010, INSGC has more strongly emphasized a focused portfolio of in-service and pre-service teacher training experiences and K-12 activities.

NASA Education Outcome 3: *Build strategic partnerships and linkages between STEM formal education providers that promise STEM literacy and awareness of NASA's mission (Engage and Inspire)*

General Public/External Relations
3.1 Resources – Provide informal education support resources that use NASA themes and content to 1) enhance participant skills and proficiency in STEM disciplines; 2) inform participants about STEM career opportunities; and 3) communicate information about NASA's mission activities.
3.2 Professional Development for Informal Education Providers – Provide opportunities to improve the competency and qualifications of STEM informal educators, enabling informal educators to effectively and accurately communicate information about NASA activities and access NASA data for programs and exhibits.

INSGC continues to promote and open doors of opportunity with the three Challenger Learning Centers, and solicit partnerships with INSGC Outreach Affiliates to provide informal educator opportunities. INSGC highlights the need to provide cost-effective support for these projects within the identified NASA Office of Education priorities for the Space Grant program.

PROGRAM/PROJECT BENEFIT TO OUTCOME (1,2, OR 3)

One of the major goals for INSGC is to increase our benefit and impact across the State of Indiana. Particularly due to the fact that Indiana does not have a NASA center within the state, INSGC can be the voice of NASA, giving Indiana residents the opportunity to learn about NASA's mission and goals, and increasing the appreciation for NASA and its many accomplishments and resources. In taking a more active and visible role within the state, INSGC will increase its exposure and value. This will lead to the development of key relationships with individuals and programs that have similar goals and interests, whereby we can leverage the financial strength of the programs, attain synergy and dramatically improve results while minimizing budgetary impacts.

In Fall 2010, INSGC began an effort to document and increase the awareness and participation of students on our academic affiliate campuses regarding the range of INSGC information, funding opportunities, and linkages to NASA resources and programs. Included in this effort was an online survey of students and faculty at two campuses, including the INSGC host Purdue West Lafayette campus. (This campus graduates the overwhelming majority of STEM majors in the State of Indiana.) Over 2000 participants at Purdue (~1400 undergrad students, ~520 grad students, ~125 faculty) responded to the survey, providing a snapshot of existing campus awareness of sources of INSGC support--and increasing that awareness during the application periods for both the NASA SOLAR summer opportunities programs and the INSGC annual scholarship, fellowship, and awards competitions. Approximately 125 underrepresented minority undergraduates, 75 underrepresented minority graduate students, and 10 underrepresented minority faculty responded to the survey, and reported awareness of INSGC and its scholarship opportunities at rates exceeding the overall survey response. These efforts, combined with increased social media presence via website, Facebook, and the INSGC Director's blog, are increasing the ability for INSGC to fulfill its goal of being a preferred source of information, materials, and opportunities for NASA-related STEM education and careers to higher education participants in Indiana.

For the 2010-2011 year, INSGC has awarded funding to projects within the targeted outcomes in alignment with our proposed allocation percentages. The outcomes and current and proposed funding percentages are as follows:

- Outcome 1 (scholarships/fellowships/internships): Current 46%, Proposed 42%
- Outcome 1 (other projects): Current 35%, Proposed 33%
- Outcome 2: Current 18%, Proposed 24%
- Outcome 3: Current 1%, Proposed 1%

Highlights and Anecdotes

The following information is not an exhaustive list, but is representative of the significance and benefits of the INSGC programs arranged by outcome.

NASA Outcome 1

Scholarships/Fellowships/Internships

The competitive awarding mechanism for INSGC scholarship and fellowship support also includes summer internships for INSGC Affiliate students at NASA Centers, and summer internships for underrepresented minority students in STEM disciplines at Purdue University in West Lafayette. A parallel program (DEMA) for INSGC support of summer internships for underrepresented minority students at Indiana University was started in 2010. INSGC also initiated a matching grant for another private donations account scholarship program at Purdue University targeting underrepresented minorities. The overall demographics for the 82 scholarship, internship, and fellowship awardees show 33% female participants and 46% underrepresented minority (URM) participants. Breakdowns per program are as follows:

- 53 Scholarships/Fellowships with 30% Female and 43% URM participants
- 3 PROP participants with 66% Female and 100% URM participants

- 15 Internships with 27% Female and 47% URM participants
- 11 DURI participants with 45% Female and 45% URM participants

Higher Education

Purdue Space Day: The 15th annual Purdue Space Day (PSD) took place on October 30, 2010 with guest astronaut Dr. David Wolf. PSD collaborated with both the College of Engineering and The School of Electrical and Computer Engineering. The event captured 528 students in grades 3-8 and 188 Purdue undergraduate students who volunteered in planning and leading the event. Over the past 15 years, PSD has touched 5,424 grade school students and 1,743 Purdue student volunteers. These student volunteers find creative ways to engage the grade students in hands-on, NASA-related learning activities that excite the grade school students to think about future careers in NASA-related research areas. The undergraduate students gain valuable leadership skills through this experience that they do not get in course work alone. The PSD executive board collects evaluations from the grade student participants and uses that information to improve the program year after year. This level of decision making trains the students to be better prepared as leaders in their future NASA-related STEM careers.

The following email from David Wolf highlights his support for the PSD program. "It was a privilege to be involved. All of you, Allie, Dave and the rest have got to know the immense good you have done for these young people. You made it easy (perhaps other than the amazing agenda) for me to add our part from NASA. But wow what a stimulating program you have created – it inspired me!!! Our country and Indiana in particular, is so lucky to have Purdue. It is no accident that many of our best come through here. Always consider me your resource."

DEMA: Diversity, Equity & Multicultural Affairs STEM Initiative Summer Scholars Institute was held at Indiana University (IU) Bloomington from June 4, 2010 through July 30, 2010. The Summer Scholars Institute enrolls select HBCU and IU college students in a continuous substantive research experience. This is part of the larger IU-HBCU STEM Initiative. Eighty-five percent of the Summer Scholars' time is spent in mentored research projects. Areas of research included cancer biology, psychology, informatics, public health, biochemistry and molecular biology. The students then presented their research at the Conference of the Committee on Institutional Cooperation Summer Research Opportunities Program (CIC-SROP) at Ohio State University (Columbus, OH) as well as at a special session on the IU Bloomington campus.

NASA Outcome 2

Research Infrastructure

SARA Telescope: INSGC support for Valparaiso University for access to the Southeastern Association for Research in Astronomy (SARA) Telescope in Kitt Peak, AZ and the opening of the SARA South telescope in Chile has provided roughly twice the capacity for observations versus the past. The telescopes were not only used for research but to broaden the participation of the general public in science. The observing experience involved a total of 33 students in the fall semester, and will be repeated in the spring of

2011 semester. Both telescopes have also been used on two nights (SARA North on one night and the SARA South on one night) as part of the regular Astronomy Open House Program. This involved a total of 60 visitors. This is expected to be repeated in the Spring Semester of 2011.

Indiana Astrophysics Network: The 1st Indiana Astrophysics Network Meeting was held at Purdue University in October 2010. The meeting gathered professors, researchers, and graduate and undergraduate students involved in astrophysics to discuss the research and educational efforts that take place at different institutions in the state. A total of 40 attendees from eight institutions across the state participated. The meeting included ten talks through the day along with 15 poster displays and closed with special guest Professor Joseph Silk (Savilian Professor of Astronomy at the University of Oxford.) The Indiana Astrophysics Meeting provided an opportunity for researchers to network with others of similar interests and make new connections for future collaboration on research projects. These collaborations have continued to develop since this very important meeting. The Evaluation and Assessment Team is currently undergoing a social network analysis in order to more fully capture the outcomes of this meeting.

Pre-College

ASM Materials Camp: Purdue University Calumet (PU-C) hosted their 3rd annual ASM Materials Camp for teachers from June 21-25, 2010. PU-C recruited teachers from middle and high school in science, math, and technology. They had 15 teachers in attendance for this year's camp. The main purpose of the camp was to show teachers, especially those of mathematics, science, and technology, how to use and integrate everyday materials easily into existing lesson plans. Participating teachers learned how to conduct low or no cost simple labs and experiments to engage students in STEM. The participants were expected to design one learning module that addressed academic standards they use to design programs in their subject area. Evaluation of the program was done through surveys administered by ASM International and resulted in a very successful response and great enthusiasm from the teachers. Further evaluation to determine if materials presented in camp have been incorporated will be conducted at the end of the school year. The ASM Material Camp from PU-C was featured in Advanced Materials & Processes, August 2010, an ASM International magazine, and Iron and Steel Technology, August 2010, the AIST monthly magazine.

NASA Outcome 3

General Public / Informal Education

Astronomy Open House: An outreach program in astronomy at Valparaiso University is part of the "Valparaiso University Observatory Public Open House" series. These series includes two public lectures each semester, observatory open houses, and a middle school outreach day. Attendance at each public lecture averages approximately 70 people.

Purdue Space Day: In its 15th year of being a successful educational outreach program for grade school students, PSD hosted guest speaker, Dr. David Wolf. On Friday night before Fall Space Day, astronaut David Wolf gave a general lecture to members of the

Purdue community and general public. This lecture is given in addition to the day-long Fall Space Day program, and was attended by over 100 people in the Fowler Playhouse of the Purdue Stewart Center. Students also took part in three hands-on STEM activities throughout the day. A total of 528 students attended in 2010.

Charles Bolden Lecture: INSGC helped to organize and support daylong activities by NASA Administrator Charles Bolden on September 7, 2010. Administrator Bolden visited with local middle school students, met with undergraduates involved with Purdue EPICS and Purdue Space Day service learning activities, and reviewed posters for six INSGC-supported students who had been involved in Summer 2010 NASA internship. The public-attendance 2010 Boeing Distinguished Lecture, at which Administrator Bolden spoke on "Our Nation's Future in Space," was standing room only with substantial overflow.

Indiana Afterschool Network: Beginning in December 2010, INSGC has partnered with the Indiana Afterschool Network (IAN) on their Project LIFTOFF planning grant. (This partnership began with an introduction at the National Conference on Summer Learning held in Indianapolis on November 9-11. This conference was also attended by NASA Associate Administrator for Education Leland Melvin, and Office of Education staff Katie Pruzan.) IAN's Project LIFTOFF grant was developed to support a statewide network of STEM education activities available beyond the school day; their proposal was rated the second best of eight successful planning grant awards from the Noyce Foundation.

Sally Ride Speaking Engagement: This spring Dr. Sally Ride, along with the Challenger Learning Center Northwest Indiana, will be presenting an outreach opportunity for second through eighth grade students to hear her speak and ask questions regarding being an astronaut. With the event taking place at Star Plaza Theatre in Northwest Indiana on April 12, 2011, it will allow a significant opportunity for outreach to grade school children and the general public in Northwest Indiana.

Personal Statements

INSGC takes great pride in the positive influence on the lives of the people served. A few of many outstanding comments regarding the role of INSGC funding in supporting their education are shown below.

Quote from Ken Simmons (Indiana University Purdue University Indianapolis) who was awarded a fellowship from INSGC:

> I received a grant from the Indiana Space Grant Consortium last August in conjunction with a project I am doing to create a "giant, traveling map" of Indiana. Commissioned by the Geography Educators' Network of Indiana (GENI), the map is to be fashioned after similar maps created by the National Geographic Society for use as interactive learning tools in elementary schools nationwide. The project I am working on will result in a large, 15'x20' "floor

map" that will visit schools from one end of the state to the other, allowing for a unique and fun medium by which to teach geography, science, history, and more.

At the present time, progress on the production of the map is coming along well. I am using a geographic information system in the work, and currently have a fairly advanced design completed (see image below). I just met with the GENI representatives earlier this week, and received some good feedback on next steps in the project.

Completion of the map, including final sign-off of the design and printing of the final product, is expected sometime this spring. Plans are in the works for promoting the availability of the map via press releases and other public relations and advertising efforts. It is hoped that there will be an opportunity to display it in either the Indiana State Museum or the Indiana state capitol building.

The INSGC's financial support of this project continues to be of fundamental importance in making it happen. *Thank you.*

Quote from Jason Kreuger (StratoStar) who was awarded project funding from INSGC:

I attended Taylor University in 2002 to pursue a degree in Marketing with a systems emphasis (using technology in business.) While at Taylor I heard about the High-Altitude Balloon program and was interested (this was funded partially through the INSGC) but at that time it was mostly for the Engineering / Physics students working on satellites, so I didn't get an opportunity to participate. My roomate's Father was a Physics Professor at Taylor (Dr. Hank Voss) and he mentioned to me that he wanted to help other Universities start High-Altitude Ballooning programs because of the success of the Taylor program. I wanted to be involved and develop a business plan to start a company to provide hardware, software and training to Universities who would be interested in conducting High-Altitude balloon launches. After competing in 2 business plan competitions I started "StratoStar Systems" the day after graduation.

Just after starting the business I worked with Taylor University and developed the "High-Altitude Launch Opportunity" (HALO) Project to engage undergraduate students in hands on STEM activities which gave them the opportunity to launch experiments into Near-Space 20 miles above the Earth. The project was funded by INSGC and we worked with 7 Universities across the Midwest (MN to OH) and launched 7 balloons within a 5 minute window to create a network of platforms collecting data over much of the Midwest. The HALO project lead to HALO II Project INSGC funded. Due to the success of working with other Universities in the original HALO project Taylor & StratoStar received $250K from NSF CCLI Program (Course Curriculum and Lab Improvement) to help start High-Altitude balloon programs at other Universities. With the CCLI grant we trained 55 Universities and reached over 1000 Students.

I am now in the 5th year of my business and we have worked with Universities in 19 States from coast to coast. We have also just received a second round of funding from NSF for our CCLI grant for $500K and have many of the INSGC affiliates as partners on the project (StratoStar, Taylor, Ball State and University of Evansville). Working with INSGC and being an affiliate has

allowed me the opportunity to speak at many different Space Grant Meetings across the country and work with students in different states.

The biggest benefit of INSGC in all the different stages of my relationship has not only been the funding and support, but interactions with passionate people who care about students and want to help them experience the excitement of Science, Technology, Engineering and Mathematics. I am able to pursue my dream of working in a STEM field because of all the hours of work INSGC staff have put in over the years. If you would like to follow-up on anything please give me a call at 765-382-0451.

Quote from Michael Zwach (Purdue University) who was awarded internship funding from INSGC:

The Indiana Space Grant Consortium has made a profound impact on my life since first sponsoring my internship at NASA Ames Research Center in the summer of 2008 with the Lunar Robotics Academy. It's hard to know where to begin in fact because so much of my academic, professional, and personal life today is a result of that first experience. By first sponsoring me for the summer of 2008 and subsequently in 2009 I was able to develop my life by taking from the experiences I had received and ignite my passion to keep dreaming about what I hoped the future would entail. In support of this I have developed my academic, personal, and professional life by changing my studies to better reflect the topics I am truly excited about and becoming actively involved in research so as to seek my passion rather than only dream. In my personal and professional life I have developed leadership skills that has encouraged me to apply to opportunities uncommon for an undergraduate student and be successful. The summation of this involvement and drive has: lead me to world travel experiences, part time work with NASA, involvement with the Space Generation Advisory Council which is in connection with the United Nation Space Affairs Office, seek graduate school opportunities, actively propose new engineering design concepts and tools, present research and design proposals, get involved on the university level to promote my vision, and always [always] dream about space and how to get there [personally]. As mentioned it's hard to know where to start and this is only the beginning of a lifetime of adventure for me.

Quote from Adam Regstorf (Purdue University Calumet) who is an affiliate director for INSGC:

INSGC has historically been best and most utilized by projects in the engineering departments at PU-C - Moonbuggy, Materials Summer camp - to great success. Over the past couple years, I have been trying to spread that around by helping the Undergraduate Research Program obtain matching INSGC funds for all their worthy STEM proposals.

Two individuals of note are Tyamo Okosun and Gabriela Campos. Tyamo received an undergraduate scholarship for several years running and is currently at Purdue West Lafayette as a graduate student in engineering. Gabriela was a great success story: last year she applied for an undergraduate scholarship, plus got one of the summer internships at Purdue West Lafayette, allowing her to

present her work at Ohio State. As a result of her experience during summer 2010, she decided to pursue a PhD instead of a master's degree and decided to transfer to Purdue West Lafayette. I am sorry to see PU-C lose such an excellent student, but am very happy for Gabby. Both Tyamo and Gabriela will make excellent longitudinal case studies for you guys. Keep your eyes on them!

PROGRAM ACCOMPLISHMENTS

Through March 17, 2011 and for the grant year May 17, 2010 through May 16, 2011, this grant has enabled INSGC to award over $509,000 with $277,333 in projects, $162,500 in scholarship/fellowship awards and $70,000 in internships. Additional funds have been directed to administrative costs, through summer internships and programs deferred from Summer 2010 to Summer 2011. Accounting through August 2011 has not yet been completed.

Note: A detailed discussion of accomplishments based on SMART objectives from the INSGC proposal follows the general discussion for each Outcome below.

NASA Outcome 1 Higher Education

The funding from INSGC has enabled many of our affiliates to participate in Higher Education Projects. These projects focused on Affiliate strengths in aerospace, engineering, astronomy, environmental studies, mechanical engineering, and physics.

1.1 Faculty and Research Support

INSGC has provided the following NASA competency-building education and research opportunities for faculty, researchers, and post-doctoral fellows.

- Interactive Visualization of Collaborative STEM Knowledge Work - Ball State University
- Lite at Night & Incidence of Breast Cancer - IUPUI
- Indiana Astrophysics Network Meeting - Purdue University
- Mycoprotein Project Testing the Potential of Using Fungi to Convert Waste into Protein - Valparaiso University
- Flood Analysis - IUPUI
- INSPIRE - Assessment Hub for STEM Literacy - Purdue University

1.2 Student Support

Scholarships / Fellowships - INSGC ran its open competition for the 2011-12 award year from December 1, 2010 through February 24, 2011. For the 2011-12 grant year, INSGC has doubled its scholarship applicants. INSGC continues to receive a growing number of requests for scholarships / fellowship awards with an increase level of recognition and prestige associated with the designation of being an INSGC Scholarship/Fellowship winner. The scholarship/fellowship interest continues to expose more underrepresented STEM students throughout the state of Indiana. INSGC supports the summer interns, Purdue PROP initiative for underrepresented minorities, Virgil “Gus” Grissom Memorial Scholarships, and Diversity Enhancement scholarships that enhance student participation at Purdue West Lafayette.

Projects - INSGC provided NASA competency-building education and research opportunities to develop qualified undergraduate and graduate students who are prepared for employment in STEM disciplines at NASA, industry, and higher education.

- Purdue Space Day - Purdue University
- Discovery Park Undergraduate Research Initiative (DURI) - Purdue University
- Matching funds for Undergraduate Research Grant Program - Purdue Calumet
- Purdue Research Opportunity Program (PROP) - Purdue University
- Diversity Equity and Minority Affairs STEM Initiative - Indiana University

1.3 Student Involvement in Higher Education

INSGC has been able to provide many opportunities for groups of post-secondary students engaged in authentic NASA related mission-based activities.

- Undergraduate Research in Observational Astronomy-Ball State University
- Undergraduate Research in Observational Astronomy-Valparaiso University
- The Moonbuggy Ergonomic Design Consideration - Purdue University Calumet
- Undergraduate Research in the End Stages of the Lives of Sun-Like Stars - Valparaiso University
- MATE ROV Competition - Purdue University
- 2010-2011 Robotics Competition - University of Southern Indiana

1.4 Course Development

INSGC had identified three projects at the time of our 2010-11 proposal that would contribute to the new / revised course SMART Objective. After that proposal was submitted, one project was declined (due to a late summer move from one of the faculty to a non-INSGC institution). The second project was deferred from 2010-11 to 2011-12 due to communications delays regarding funding availability during summer 2010. We have provided funding to this project beginning in summer 2011, for project execution during the 2011-12 academic year.

- New Media Approaches for Cross-Disciplinary Education and Community Awareness of Remote Sensing and Land-Use Dynamics - Indiana University

Other Higher Education

In addition to scholarship and fellowship support for underrepresented minority students, ongoing relationships with the Minorities in Engineering Program, Women in Engineering Program and Diversity Resources center at Purdue University provide a continuing environment for engaging students previously underrepresented in STEM disciplines.

Preliminary results of the Purdue West Lafayette campus survey of INSGC recognition indicated that attempts to increase visibility of funding opportunities and resources have resulted in growing awareness of INSGC's role in the largest STEM degree granting institution in Indiana. In fact, underrepresented minority awareness of INSGC among

undergraduate, graduate, and faculty populations were higher than of the survey respondents as a whole. Over 10% of both engineering and science undergraduates were aware of INSGC scholarships as of March 2011, which helps to clarify the increased number of applicants in the 2011-12 scholarship competition. In addition, awareness of NASA internships across undergraduate engineering and science populations reflects the large number of Purdue students (over 55 as of March 17) registered in the SOLAR student opportunities system for 2011 programs.

Responses to the INSGC survey on the Purdue campus demonstrate increased awareness and participation among underrepresented minorities. Approximately 14.5% of graduate student respondents were from underrepresented minority groups, exceeding their general representation in the STEM university population. These graduate students demonstrated relatively higher awareness of INSGC and its scholarship and fellowship programs compared to non-underrepresented student groups. At the undergraduate level, awareness of INSGC has expanded considerably beyond its traditional focus on aerospace engineering students. Over 11% of responding Science undergrads were aware of INSGC scholarships, and undergraduate students from seven of 11 engineering majors in the College of Engineering (eight of 11 at the graduate level) reported awareness of INSGC prior to the survey.

Research Infrastructure

1.3 Student Involvement in Higher Education

- High Resolution UV-Visible Balloon Spectrometry

1.5 Targeted Institution Research and Academic Infrastructure

- Undergraduate Research in Observational Astronomy Using the SARA Telescopes in AZ and Chile - Valparaiso University

Objective A: Faculty, researchers, and doctoral fellows who receive INSGC funding will report increased research capacity and competency as a result of their awards. (Objective 1.1)

Accomplishments: Projects supported by INSGC in 2010-11 have been highlighted in local and national news media (including a public television special on astronomy research conducted at Ball State University). These media reports do indicate reports of increased research capacity and competency, although not all reports indicate INSGC support of these projects. Sample anecdotal reports have been included in Performance Data summaries included in this document and elsewhere. Formal evaluations are still ongoing, but delayed until the return of students and faculty after the end of Summer 2011.

Objective B: Students who participate in INSGC higher education programs will report an increased: a) interest in STEM study and careers, b) understanding of NASA programs, and c) perception of leadership skills. (Objectives 1.2 and 1.3)

Accomplishments: (Based on Fall Space Day participation, Average Scores reported: 1= Strongly Disagree, 2= Disagree, 3=Neutral, 4=Agree, 5=Strongly Agree)

Impact Score	Impact Evaluation Question
4.25	I have gained skills in this experience that will help me in my educational goals.
4.18	I have gained knowledge through this experience that will help me in my educational goals.
4.19	I am more interested in my field of research as a result of this experience.
3.86	I have gained skills through this experience that I could not have gotten through coursework alone.
4.14	This experience has increased my interest in careers related to my field of study.
3.93	I am better prepared for a career in my field as a result of this experience.
4.19	This experience has given me more confidence in my ability to have a successful career.
4.70	I would recommend INSGC to other students.
4.00	This has been a highlight of my educational experience.

Objective C: At least 60% of INSGC higher education program student participants will seek employment with NASA, aerospace contractors, universities, and other educational institutions. (Objective 1.2)

Accomplishments: According to INSGC's longitudinal tracking, 58% of our significant awardees have secured employment in STEM related fields including NASA, Aerospace, academia, and other STEM-related fields. This value is based on reported data from longitudinal tracking of significant awardees.

Objective D: At least 40% of undergraduate students who participate in NASA higher education programs will move on to advanced education in NASA-related fields. (Objective 1.2)

Accomplishments: According to INSGC's longitudinal tracking, 31% of our significant awardees have pursued advanced STEM degrees. This is short of our goal of 40%; we anticipate an improvement in this and also note that these figures represent only reported data on significant awardees.

Objective E: At least 25 underrepresented and underserved students (minimum 30% of total) will participate in INSGC-funded higher education programs in FY2010.

Accomplishments; 48 underrepresented students participated in INSGC-funded higher education programs which is over 39% of the total.

Objective F: At least 2 new or revised course targeting STEM skills needed by NASA will be created through INSGC support in FY2010 (Objective 1.4)

Accomplishments: The primary additional Course Development effort for INSGC was the University of Evansville project 'University Student Launch Initiative' which included development of a Mechanical Engineering course. This project was deferred to the 2011-2012 funding cycle due to the delay in funding for 2010-2011. Additional projects which included course development include the Indiana University – Purdue University 'Annual Flood Risk Discovery Project' which elected to conduct several workshops rather than develop a course, and IPFW/Taylor University project 'Student Research in Nanoscience Technology for Quantum Electronics and Energy, Sustainable Applications in Space Exploration' which was ultimately declined due to the fact that the PI left the university.

NASA Outcome 2

Pre-College

Pre-college programs emphasized the support of activities for K-12 students to participate in STEM related activities and increase enthusiasm to pursue STEM majors at the university level. Rather than supporting individual teams or schools, INSGC chooses to support the programs as a whole. These programs included:

2.1 Educator Professional Development - Short Duration

- ASM Materials Camp for Teachers - Purdue Calumet
- Indiana Science Initiatives for Space - SpacePort Indiana

2.3 Curricular Support Resources

- STEM Resources for Indiana's Pre-service Teachers - Challenger Learning Center of Brownsburg

2.4 Student Involvement K-12

- Options for Middle School Girls - University of Evansville
- FIRST activities - Purdue University
- Options for Middle School Students - University of Evansville
- Student Space Flight Experiments Program - NCESSE

General Public-Informal Education

2.4 Student Involvement K-12

- UE Spring Space Day - University of Evansville
- Outreach Program in Astronomy - Valparaiso University

3.2 Professional Development for Informal Education Providers

- Indiana Afterschool Network

The partnership with the Indiana Afterschool Network (IAN) has resulted in several new opportunities for INSGC coordination of general public and informal education networks across the State. The $2500 INSGC partnership award to IAN helped to secure a $5000 planning grant from the Noyce Foundation for Project LIFTOFF, to increase opportunities for STEM educational activities beyond the school day. Although this planning grant continues beyond the end of the INSGC program year in May, the Project LIFTOFF activities have already brought together a variety of partners and state government offices. A progress report and presentation of Project LIFTOFF will be one of the partnership presentations at the INSGC Annual Affiliates' Meeting, to be held on April 12-13, 2011 at the Indiana State Museum in Indianapolis.

External Relations

2.4 Student Involvement K-12

- Bolden/Boeing Lecture - Purdue University
- Space Flight Symposium Speakers - Purdue University
- Reaching for the Stars Sally Ride Speaking Engagement - Challenger Learning Center of Northwest Indiana

  On April 12, 2011 (the 50th Anniversary of human spaceflight and 30th Anniversary of the first Space Shuttle Launch), Dr. Sally Ride will be speaking in Merrillville, IN at an event organized by the Challenger Learning Center of Northwest Indiana. The $5,000 INSGC award to the Challenger Center was instrumental in securing additional $15,000 in funding commitments and other resources to enable Dr. Ride's planned presentation to over 3,000 persons. This continues the INSGC efforts to bring the excitement and engagement of STEM activities to a substantial number of Indiana residents, and helps foster INSGC goals to be a preferred source of opportunities for inspiring individuals for NASA-related STEM education and careers.

Objective A: At least 75% of elementary and secondary educators who participate in two or more NASA training programs will use NASA resources in their classrooms. (Objective 2.2)
Accomplishments: Materials Camp and Summer of Innovation, all teachers received NASA related materials. We have not received teacher names from all of the programs, partly due to challenges with not all programs being willing to share that information. We cannot track teacher participation in multiple programs. Several of the programs are currently conducting longitudinal tracking on their own and will be able to report on their finding in future annual reports for teachers involved in multiple programs.

Objective B: At least 60% of elementary and secondary educators who obtain NASA content-based education resources or participate in short-duration NASA education activities will use NASA resources in their classroom instruction (Objective 2.1)

Accomplishments: Longitudinal tracking is underway for INSGC projects involving elementary and secondary educators in short-duration NASA education activities. In 2010-2011 the assessment tools were developed and shared with affiliates for future use in their programs. These include efforts to collect self-reported data on utilization of NASA resources in the classroom by the educators. This information will continue to be reported in 2011-2012.

Objective C: At least 50% of students will express interest in science, technology, engineering, and math (STEM) careers following their involvement in elementary and secondary education programs (Objective 2.3)

Accomplishments: Extensive evaluation and assessment has been developed for Purdue Space Day. Relevant results of the evaluation of elementary student participants is presented below.

As a result of attending Purdue Space Day:	Mean (Std. Dev.)
I am interested in a job in science	4.60 (±1.15)
I am interested in a job relating to space	3.27 (±1.24)
I learned more about space exploration	4.19 (±0.96)
I am interested in learning more about space	4.16 (±0.97)
I learned about the connection between space and engineering	3.90 (±1.09)

The evaluation and assessment efforts on Purdue Space Day have helped inform efforts on other programs. The current project that INSGC is helping with evaluation efforts is Purdue FIRST. These improved evaluation mechanisms will be enacted in the coming year. External data is available from other studies on the FIRST program which demonstrates the positive impact participation has on students (www.usfirst.org).

% favorable	Impact Metric
89	Increased understanding of the role of science & technology in everyday life
86	Increased interest in science and technology
69	Increased interest in science and technology careers

a) At least 500 elementary and secondary students will participate in INSGC instructional and enrichment activities (Objective 2.4)

   Approximately 2000 elementary and secondary students have participated in INSGC activities during the 2010-2011 funding cycle.

NASA Outcome 3

3.2 Professional Development for Informal Education Providers

- 2010 Annual Flight Director Conference - Challenger Learning Center Brownsburg

At least 4 museums and science centers in Indiana will actively engage the public in major NASA events, with exposure of at least 1000 persons to STEM content and educational opportunities available through INSGC.

Indiana's 8 museums and science centers served over 1300 persons through their programs on STEM content and educational opportunities available through INSGC.

At least 25 informal educators will report increased efficacy as a result of INSGC supported professional development.

Project Liftoff has expanded its scope and range of activities into 2011-2012 due to the Summer of Innovation award. This has increased the number of informal educators involved in INSGC supported professional development. In order to report increased efficacy we have to include educators participating in Summer of Innovation and other programs whose longitudinal evaluations extend past the date of this report. A discussion of this evaluation will continue in the 2011-2012 reporting.

PROGRAM CONTRIBUTIONS TO PART MEASURES

- **Longitudinal Tracking:**
  INSGC continues to update and follow current and previous significant awardees with our longitudinal tracking surveys and Facebook connections. We have been successful in tracking >80% of the significant awardees since 2005 and >75% of the significant awardees since 1995. As of August 2011, INSGC has updated tracking information on 111 of 127 awardees (87.4%) since 2005. A master database of all awardees since 1995 (including the most liberal estimates of duration and funding to indicate "significant awardee") indicates updated tracking information on 167 of 213 awardees (78.4%)

- **Course Development:**
  Funded projects for the current year did not include an emphasis on Course Development. A major effort in this regard was undertaken three years ago, and a decision to focus on other areas was made for the current funding cycle.

- **Matching Funds:**
  INSGC continues to achieve greater than 1:1 matching for non-scholarship funds. The cost sharing ratio, as indicated in the APD expenditure summary table, indicates cost sharing of $670,601 on an award total (excluding scholarships and fellowships) of $603,000. This represents a ratio of 1.11 of cost sharing to total INSGC award. As we continue working with the Evaluation and Assessment team, some matching from Purdue College of Education is covered. INSGC receives non-federal dues from academic affiliates to support travel and expenses not allowable on NASA funds. Minimum one-to-one matching is required for all proposals submitted to the INSGC grant program competitions; overmatching is encouraged. Programs like Purdue Space Day, UE Spring Space Day, FIRST, and CLCNWI-Sally Ride engagement, obtain substantial matching funds from corporate donations. Matching funds are not required for scholarships and fellowship programs, but INSGC prohibitions against tuition fee remission charges has allowed academic affiliates to provide another source of matching for graduate fellowships.

  Currently, INSGC has $516,230 match towards its project awards of $277,333.

- **Minority-Serving Institutions:**
  INSGC does not have a designated Minority Serving Institution among its academic affiliates; no Historically Black or Hispanic Serving Institution with a focus on STEM degrees exist in the state. However, both Purdue and Indiana University (where the overwhelming majority of underrepresented STEM minorities are enrolled) have strong relationships with minority serving institutions in other states.

  INSGC does partner with Purdue Research Opportunity Program (PROP) and Diversity, Equity and Minority Affairs (DEMA) where we are able to reach several

underrepresented students from eight different campuses throughout the U.S. who come to Purdue for the opportunity to conduct research and receive mentorship from faculty in diverse areas of study. This provides an opportunity for undergraduate underrepresented minority students in STEM fields to experience what it would be like to pursue a graduate degree in their field of research. One participant said, "This experience provided a glimpse into what grad school entails, and that is something that isn't covered in your classes." Another student said, "This is a wonderful experience for any student, even if they're not sure what they want to do next. What they will learn is priceless."

IMPROVEMENTS MADE IN THE PAST YEAR

Management

The Evaluation and Assessment Team completed a comprehensive organizational assessment between November 2010 and January 2011, which reflected tremendous improvement and progression from the one conducted between October 2009 and January 2010. Dr. Dawn Whitaker was selected as the new Program Manager beginning in September 2010 and continues to make great strides with INSGC. With the resignation of the INSGC receptionist in October 2010, Angie Verissimo has been hired in a permanent position as Operations Coordinator.

In our improvement plan, one of INSGC's central office goals was to increase the affiliate's knowledge, satisfaction, and participation. To help in this regard, an Affiliate's Manual was written and distributed, covering the basics of information needed by affiliates (e.g. proposals, invoicing, goals of INSGC, etc.). The completion of the Affiliate Manual has provided a better understanding of our processes and connections and has fostered goodwill for the consortium. Our evaluation team established a baseline of affiliate knowledge on award processes prior to the sending the manual, and will do the post-test after the affiliate's meeting to compare knowledge and satisfaction after distribution. Improvements to the website and the Scholarship/Fellowship/Project application process have enabled a smoother, more user friendly experience for applicants and visitors to the website.

Dr. Dawn Whitaker has initiated in-person visits to affiliate locations, meeting with affiliate directors to develop a more personal relationship and help answer any concerns and provide solutions. As of February, 2011, she has visited seven affiliates and will be meeting with two others in March. She has also assisted many applicants with their proposals. Due to her experience with NASA she has been able to assist them in finding current NASA research projects and goals, and has connected Indiana researchers with NASA Center researchers, thereby making Indiana's proposals more relevant and increasing the diversity of research topics funded. This is the start of an effort to expand the range of STEM disciplines that are touched by INSGC state-wide.

Increasing Visibility

INSGC is striving to increase our visibility on affiliate campuses and throughout the state. The INSGC Assessment and Evaluation Team conducted surveys on the campuses

of Purdue University and the University of Evansville in the months of January and February 2011. The surveys were sent to undergraduate, graduate students, and faculty. Also, brochures and posters were created in December, 2010 and circulated using the following tactics:

1. Current awardees were given copies and asked to hang them on bulletin boards and circulate them on their campus,
2. High school guidance counselors we given copies of the brochures and posters, targeting areas with high STEM involvement, geographically underrepresented areas throughout the state, areas with high underrepresented minority enrollment, and schools with high STEM academic test results.
3. Science centers, newsletter subscribers, and other interested parties throughout the state were sent the information.

These efforts along with those of our affiliates produced a 168% increase in the visits to the INSGC website based on data from Google Analytics. Google Analytics was initiated on the INSGC website in October 2010. This will allow us to effectively evaluate our efforts to reach out within the state. Since the INSGC funding application process is managed almost exclusively online, website utilization would inevitably increase as the deadline for applications approaches (February 24, 2011). However, the fact that our scholarship applications doubled this year over the previous year indicates the success of our efforts. The Google Analytics data for this year will serve as a baseline in years to come and will provide more accurate, interpretable data for future reporting.

Updates in the INSGC Website, Facebook page, and other social media / communications processes have also increased undergraduate student awareness of INSGC scholarship, fellowship, internship, and project activity. Announcements regarding INSGC opportunities to the >200 student volunteers at the Purdue Fall Space Day event, as well sponsorship designations for Space Day, the Bolden Lecture, Astrophysics Network, and other programs, have also helped to encourage students and faculty to follow INSGC activities. The 2011 submissions to scholarship and fellowship competitions, as well as participation in SOLAR opportunity registration (over 55 students at Purdue University alone), demonstrate considerable increases over previous years. Two student team projects have already been funded for 2010-2011 based on this increased student awareness.

Evaluation and Assessment

Significant progress has been made this year in Evaluation and Assessment. A visibility survey was completed on several affiliate campuses which served a dual purpose of setting a baseline for the awareness of the students of INSGC programs while also inherently introducing INSGC. This survey targeted STEM majors on the campuses. Over 2000 respondents from the Purdue student (~1400 undergraduates, ~520 graduate) and faculty (~125) populations responded to this online survey. Preliminary results of the Purdue campus survey are still being processed, but have already provided important insights regarding the breadth of connections across STEM majors, and opportunities for further communication and recruitment needs.

Participants in the fall affiliate telecons were surveyed about the success of the telecon process and how satisfied they are in general with INSGC. Work has begun on evaluating the Indiana Astrophysics Network. An annual review process was also established for Purdue Space Day which will allow the student board to perform their own evaluation and assessment of the program on an ongoing basis, institutionalizing the process.

Projects

General Public and Informal Education activities have been balanced out to focus on Higher Education elaborating and highlighting the STEM strengths of the INSGC Academic and Outreach affiliates. INSGC continues to strive in reaching areas within the state where STEM initiative outreach is less visible.

Observational Astronomy: A Collaborative Research Program in Observational Astronomy by University Students continues to reach beyond the two universities (Valparaiso and Ball State University) which INSGC supports.

Purdue Space Day: In its 15th year, Purdue Space Day has been a project that INSGC continues to support. PSD once again showed a significant increase in their outreach numbers to students in grades third through eighth grade. To date, PSD has interacted with 5l,424 children in their 15 year history.

Collaborations and Partnerships

Space Day Program Dissemination: A program sponsored by the INSGC, Purdue Space Day, (PSD), is an initiative designed to give young people in grade three through eight, the opportunity to learn about astronautical engineering and space exploration through hands on experiences with the intention of sparking their interest in science, technology, engineering and mathematics. (STEM) The existence of the PSD programs at several sites including Spring Space Day at the University of Evansville also supported by INSGC, has opened the possibility of addressing community and educational needs that extend beyond those of a university and its local community.

*DURI***:** INSGC, a larger supporter of DURI for 2010-11, has significantly provided the opportunity to connect with local corporations within the state through the outreach of interns we are able to support. This also enables student's occupational opportunities across the state, foster economic growth of local businesses through increased access to skilled labor, and driving economic growth with the connection of STEM.

IAN: Indiana Afterschool Network project LIFTOFF, has the opportunity to collaborate and partner with Central Indiana Corporate Partnership (CICP), BioCrossroads STEM Initiative, Governor Mitch Daniels and the Department of Workforce Development in aligning program dollars allocated for middle and high schools to promote the "STEM" disciplines.

New Affiliates: INSGC has received four requests for new affiliate/partnerships including: Anderson University, Evansville Museum of Arts and Science, Wisdom Tools, and Indianapolis Children's Museum.

Purdue P-12 Portal: The Purdue P-12 Portal connects families and education professionals with Purdue University programs, activities and outreach. The website allows the public to search for available activities, research, and outreach by activity title, target audience, or activity type. INSGC has begun listing our events in the portal to increase publicity.

Bolden Lecture: A partnership between the Purdue University Office of the President, College of Engineering, School of Aeronautics & Astronautics, and the Indiana Space Grant Consortium enabled a full-day visit by NASA Administrator Charles Bolden. Before his presentation of the William Boeing Distinguished Lecture, Administrator Bolden visited with local middle school students and Purdue undergraduates engaged in service learning projects. Undergraduate and graduate students who had recently completed summer internships at NASA Centers also gave poster presentations reviewed by Administrator Bolden. INSGC Director Barrett Caldwell was among the organizers of the event (including supporting the poster presentations and encouraging inclusion of middle school and undergraduate students), and helped to host the Administrator during his day on campus.

PROGRAM PARTNERS AND ROLE OF PARTNERS IN PROJECT EXECUTION

One of the priorities this year for the INSGC office has been the engagement of the Affiliates. INSGC encourages the affiliates to actively work with the office and to discuss and contribute to the strategies of the consortium. We have also begun strategic discussions on the role of partners in project execution, as well as input regarding selection of projects to foster. An example of this solicitation of input is the selection of Environment/Climate and Biomedical Theme Topics for the annual project competition during the fall telecons. We have also requested affiliates to make presentations at the Spring Affiliate Meeting to facilitate new consideration of partner status. The objective is to clarify the role of partners in INSGC and how to best create mutually beneficial relationships with industry, government, outreach, and other groups throughout the state to maximize the impact of INSGC.

All Affiliates (Academic, Outreach, Corporate) have voting rights and responsibilities for approving strategic directions and Consortium program decisions discussed at Affiliate Meetings. INSGC generally holds two Affiliate meetings per year. On October 25, 2010, the annual Fall Teleconference took place from Purdue University. The Director gave a brief summary of the National Meeting, expected budget priorities, tapping into the state with community colleges, state capabilities, employment functions and connection with industries. The Director than covered the Augmentation Perspective, upcoming open competition, (December 1, 2010 through February 24, 2011) and the Awareness and Visibility of Space Grant throughout Indiana. In closing, the Director spoke about the annual two-day, physical attendance, Affiliate Conference being held in April 2011 in Indianapolis, Indiana. One of the key objectives of this conference is building upon new partnerships that have started this year and initiating new ones.

A list of current Affiliates by type follows:

Academic Affiliates
Purdue University – Lead Institution
Ball State University (Ronald Kaitchuck)
Indiana State University (Susan Berta)
Indiana University – Bloomington (Paul Edwards)
Indiana University Purdue University Fort Wayne (Jihad Albayyari)
Indiana University Purdue University Indianapolis (David Coats)
Purdue University Calumet (Adam Rengstorf)
Purdue University College of technology at Columbus (Jack Head)
Taylor University (Jeff Dailey)
University of Evansville (Philip Gerhart)
University of Southern Indiana (Glen Kissel)
Valparaiso University (Bruce Hrivnak)

Outreach Affiliates
Brownsburg Challenger Learning Center (Mary Patterson)
Challenger Learning Center of Northwest Indiana (Amanda Maynard)
Ethos, Incorporated (Patsy Boehler)
IMAX Theater (Craig Mince)
Indiana State Museum (Peggy Fisherkeller)
Indianapolis Challenger Learning Center of Decatur Township (Cyndy Meier)
Science Central (Martin Fisher)
SpacePort Indiana (Brian Tanner)
Terre Haute Children's Museum (Lynn Hughes)

Corporate Affiliates
StratoStar Systems (Jason Krueger)

Submitted on behalf of the Indiana Space Grant Consortium

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Barrett S. Caldwell, PhD, Director
Indiana Space Grant Consortium